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Inventors & the [illegible]

A SHORT

NARRATIVE OF FACTS

RELATIVE TO THE

INVENTION AND PRACTICE

OF

STEAM-NAVIGATION

BY THE LATE

PATRICK MILLER, Esq. of Dalswinton.

DRAWN UP BY HIS ELDEST SON

PATRICK MILLER, Esq.

From the Edinburgh Philosophical Journal,

JULY 1825.

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NARRATIVE OF FACTS

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BY THE LATE

PATRICK MILLER, Esq. of Dalswinton.

THE vast importance into which the practice of navigation by Steam has suddenly grown up within the few last years, and the prodigious influence which it seems destined in its future progress to possess over the intercourse of mankind in every quarter of the globe, have naturally attracted the public curiosity to the discovery and ascertainment of those earlier attempts of ingenious or patriotic individuals, which have led the way to such unexpected, and, in truth, such marvellous results. Upon this, as upon all similar inquiries connected with the history of inventions, some degree of obscurity and uncertainty has been found to prevail, which has, as usual, given birth to various false and unwarrantable pretensions; and, while some of these have been gradually winning their way on the candour and credulity of the world, I have had to experience no slight degree of self-reproach, in so long refraining from the assertion

and public vindication of the claims of my Father to be held and acknowledged as the real author of the modern system of navigation by means of steam. In now performing thus tardily that act of duty to which I have felt myself imperiously called, I shall studiously confine myself to a brief narrative of facts, such as I feel confident will supersede the propriety or necessity of any controversial discussion on the subject.

The practical system of modern steam-navigation may be said to consist of two distinct parts. These are, in the first place, the application of wheels or rotatory paddles to the propulsion of vessels; and, in the second place, the substitution of the irresistible power of steam in place of animal strength, or any other species of mechanical force, in the working of those rotatory paddles.

Without any violation of what ought to be admitted as genuine historical truth, it may be said, that both of these are modern and very recent inventions; while, at the same time, it is not to be disputed, that some rude and long forgotten attempts at both may be traced to periods considerably more remote. Thus, it is undeniable, that, in the 15th century, small vessels, propelled by means of rotatory paddles instead of oars, were employed on some of the rivers of Italy, although the practice seems to have been very limited, and long since disused, as very inferior in efficacy to that of ordinary oars; and, in so far as I have had any opportunity of learning, the existence of the practice is nowhere recorded but in the work of Robertus Valturius, *De Re Militari*, first published at Verona in the year 1472,—a work of considerable note in the author's own time, but which has been for ages neglected and unknown, unless to the more curious in early bibliography. In like manner, it is undeniable, that, about ninety years ago, an ingenious person of the name of Jonathan Hulls invented a machine "for carrying ships and vessels out of or into any harbour or river against wind or tide, or in a calm," for which he obtained royal letters-patent, dated in the year 1736; an invention consisting of a small vessel, which he properly enough calls a Tow-boat, having a ~~retaining~~ rotatory paddle extended from its stern, which was

put in motion by a small and simple steam-apparatus placed in the body of the boat; and with the aid of this tow-boat, he proposed to drag larger vessels out of ~~the~~ harbour in a calm, or against the wind and tide. It would be unjust to the memory of an ingenious speculatist, to deny to Jonathan Hulls the credit of having first conceived the idea of rendering the power of steam subservient, in any measure, to the purposes of navigation; while, on the other hand, it would be quite absurd, and equally unjust to the claims of posterior inventors, to state his little tow-boat as bearing any close analogy to the steam-vessels of the present day, or to insinuate the possibility of any hint having been derived from the description and draught of his new invented machine, printed by Hulls in 1737, but of which, till within the last few years, no copy was known to exist. In a word, it may be fairly stated, that, forty years ago, no man, either professional or speculative, had seriously thought of substituting rotatory oars or paddles in place of sails in the propulsion of large vessels at sea, or of employing the boundless force of steam for any purpose of this nature.

Thus ~~This~~ much I feel myself warranted in saying, that, in the various experiments on both of ~~these~~ parts of the system upon which my father is known to have expended his means, he was not impelled or guided by any previous discoveries, either of ancient or more recent date.

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And here I hope to be pardoned for saying a few words of the person, whose claims to the grateful recollection of his countrymen I have thought it my duty to record. My father was not of any profession, either military or naval; his proper business was that of a banker, by means of which he had accumulated considerable wealth, on which, however, he appeared to set little value, unless in so far as it enabled him to indulge his ruling passion for the promotion of improvements in the arts, tending either to national security or to the general benefit of mankind. In prosecuting his schemes of this nature, which he always did with a certain characteristic energy and zeal not easily to be baffled, nothing could be more remote from his thoughts than any sordid or selfish ends; and even in their successful accomplishment, his own personal credit and

consideration seemed to be almost entirely forgotten; and had his talents and his means been in all respects equal to his own public spirited and truly patriotic wishes, there was hardly any limit within which his prudence would have set bounds to his exertions for the benefit of his country.

The present is not a fit occasion for me to enter into a detail of the numerous and important schemes of improvement in which my father ~~was~~ had embarked at various periods of his life. It may here be enough to say, that, among others, he bestowed much thought, and expended very large sums, on the improvement of artillery and naval architecture.

One of the immediate results of his experiments of the first description, was the fortunate and well known invention of the carronade; and it was in the course of his speculations and experiments on the latter, that he was led to think of devising some improved modes of constructing or propelling vessels in circumstances where the ordinary resources of the nautical art were insufficient or unavailing. Among these the construction of double and triple vessels, to be moved by wheels placed in proper situations, had occurred to him as calculated to prove of essential service; and, accordingly, he did not hesitate in building and equipping several vessels of this description, which he considered as fully warranting his own previous expectations of advantage.

Having so far satisfied himself of the utility of this scheme, he printed at Edinburgh a work, in both the English and French languages, which he entitled, "The Elevation, Section, Plan, and Views of a Triple Vessel, and of Wheels, with explanations of the figures in the engraving; and a short account of the properties and advantages of the invention."

This work is here peculiarly interesting, not only as displaying my father's great exertions for the improvement of naval architecture, but by recording the first announcement of his intention to employ a power more adequate to the ends in view than that either of human strength or of ordinary mechanical contrivance. It is with this view that I deem it necessary to quote a few of the more important passages of the work.

"Inventions which have a tendency to promote the happiness, or to increase the comforts, of mankind in general, should, as soon as they have been brought to any degree of maturity, and can be described with tolerable precision, be communicated to the world at large.

"Impressed with this sentiment, I have caused to be engraved a plan and views of a triple vessel, constructed on a new principle, and also a plan and view of a wheel to give her motion through the water. That engraving, with explanations, is subjoined. The properties peculiar to vessels so constructed, with the benefits which may be expected to result from them to society, I shall endeavour to describe as clearly as the nature of the subject will allow.

"The years I have applied myself to this subject, and the many experiments I have made with vessels which I caused to be built for the sole purpose of improving naval architecture, have given rise to the invention which I now communicate.

"The first and principal property of vessels constructed upon the plan here communicated, is derived from the wheels, the mechanism of which is simple and obvious. To work them seamanship is not requisite, for it can be performed even by the most ignorant,—strength and agility in the men employed being all that is necessary.

"From the experiments I have made in different vessels with the wheels wrought by cranks, as shewn in the plan, it appears to me, that ships, however great their burden, if there be no wind, and the water is smooth, may be made to pass through it at the rate of from three to four miles an hour.

"When the movement of the wheel comes to be aided by mechanical powers, so as to accelerate its revolutions, the before-mentioned rate of a ship's going through the water will be in proportion to the power used.

"I have also reason to believe, that THE POWER OF THE STEAM-ENGINE MAY BE APPLIED TO WORK THE WHEELS, SO AS TO GIVE THEM A QUICKER MOTION, and consequently to increase that of the ship. In the course of this summer I intend to make the experiment, and the result, if favourable, shall be communicated to the public."

And, after enumerating the peculiar properties by which those vessels were distinguished, and the various benefits to navigation resulting from these properties, he seems to have thought it necessary to apologise for not having conducted the experiments on a still more expensive scale.

" It was my wish to have built The Edinburgh [the triple ship, of which the engraved plans are annexed to the book] on a scale sufficiently large to have rendered her fit for a voyage of any length. This would have shewn more clearly the principle of her construction, and would have enabled me to ascertain with greater accuracy, not only the best forms and proportions of the three vessels, but also the proper distances at which they ought to be placed from each other. From an undertaking of such magnitude, however, I was not only prevented by the attention I owed to the duties of a great business in which I was then engaged, but I was also restrained by prudence, having, during the late war, expended large sums in numberless experiments for the improvement of artillery, with a view to aid my country, and having, since the peace, incurred much expence in building various vessels, with a design to improve naval architecture."

And, after giving various important suggestions as to the proper construction of such vessels, he thus concludes his statement.

" Having thus thrown out these few remarks upon the invention I now communicate to the world, I submit it to their consideration. As to the truth of my system, it may be easily ascertained by any Prince in Europe. It will be an undertaking patriotic and beneficent; and if followed with the success which I expect, must be attended with the happiest consequences to his subjects.

" As to myself, after some years bestowed in study and application to this subject, the present time forms to me a period of repose and satisfaction. The vessel of which the engraving is annexed, is the eighth which I have had built, with a view to improve naval architecture. One of them, built at a considerable expence, lies proscribed and rendered useless by the above mentioned statute, enacted after the vessel was launched. Notwithstanding this, I was refused a license to make experi-

ments with her at my own expence; experiments unconnected with any sordid view, and which aimed at nothing but promoting the general welfare of mankind.

"The light in which the utility of this invention shall be viewed by the public, will enable me to judge how far it may be proper to make known another system, founded upon a combination of the powers of an improved artillery with those of an improved naval architecture.

"That system is of such a nature, as, from its very great superiority, to give a decided advantage to the State by which it shall be first adopted. My only view, however, being to promote the happiness of mankind, a discovery of this system will not be made, without having just reason to expect that it will be employed for that beneficent end *."

It may be readily believed, that the hint contained in this publication of my father's, of his intention to apply the power of steam to the whole of his double and triple vessels, was not hastily thrown out. In the course of his various experiments

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* On the estimation in which my father was held by his contemporaries, at the period of this publication, I may be pardoned for appealing to the following passage in the Memorials of Great Britain and Ireland, by his distinguished kinsman the late Sir John Dalrymple, Bart.

"Mr MILLER, a banker, of great wealth and ancient family. He is the same person who invented and improved the carronade-gun, and who has lately invented an improvement upon shipping of perhaps still greater importance to a naval nation,—a triple ship, worked by wheels in the two separations between the three vessels, in a calm, and when the wind is contrary; which has the three following advantages,—that she advances in a calm when other vessels stop, or against the wind when other vessels are driven back; that she makes the whole sea-coast of the world a harbour by the shallow water which she draws; and that she saves from shipwreck on sea-coasts, because, by means of her wheels, she can be kept off any coast in time of danger. I know not his equal in this island in point of invention, sagacity to regulate it, industry and spirit.

"Mr Miller lately sent a present of his book, with plates, to describe the vessel and its principles, to every Sovereign of Europe, and also to the American States, because he thought that the invention ought to be the property of human kind. Copies of it were also sent to the Royal Society at London, the Advocates' Library in Scotland, and the University Libraries of that country, and, I believe, also of England; and he constructed, and tried in the sea, several of these vessels, to ascertain which was the best form, at his own expence, which has been a very great one."

on the comparative velocity of his vessels with those propelled by sails, or by ordinary oars, which had given occasion to several interesting and animating contests for superiority, he had strongly felt the necessity of employing a higher force than that of the human arm, aided as it might be by the ordinary mechanical contrivances; and, in this view, various suggestions were successively adopted and laid aside. Thus, at one time, it occurred to him that the power of horses might be usefully employed; while, at another, the aid of the wind itself seemed to furnish the means of counteracting its own direct and ordinary operation. But among all the possible varieties of force, that of steam appears to have presented itself to his mind, as at once the most potent, the most certain, and the most manageable.

And here it is that I experience a heartfelt satisfaction in recording the merits of a most ingenious, as well as modest and worthy man, who then resided in my father's family as the tutor of two of his younger sons, and whose thoughts had been much turned towards the improvement of the steam-engine. To Mr James Taylor's enthusiasm my father always professed himself indebted for assistance in his favourite pursuits; and it was in the very heat of a keen and breathless contest, in which they were one day engaged with a custom-house boat, on the Leith establishment, that Mr Taylor called out to my father, That they only required the help of his steam-engine to beat their antagonists.

This casual and random ejaculation was not lost on my father. It led to many subsequent discussions on the practicability of this application of force, in the course of which various expedients were thought of for overcoming the most obvious mechanical difficulty,—that of converting a direct rectilinear into a rotatory motion, and the no less obvious danger from fire, in certain states of the weather; but it was under a very confident anticipation of the success of the experiment, that my father alluded to the subject in his publication of February 1787.

In making his first experiments, he deemed it advisable, in every point of view, to begin upon a small scale; yet a scale quite sufficient to determine the problem which it was his ob-

ject to solve. He had constructed a small and very handsome double vessel with wheels, to be used as a pleasure-boat on his lake at Dalswinton; and in this little vessel he resolved to try the application of steam. On looking round for a practical engineer to execute the work, Mr Taylor recommended to his attention William Symington of the Wanlockhead Mines, whom he had known at school, and who had recently contrived a mode of applying the force of steam to wheel-carriages. My father was pleased with the ingenuity of his contrivances, and accordingly employed him, along with Mr Taylor, to superintend the construction of a small steam-engine, to be used in this projected experiment. This was in the spring of 1788; and it was not till the following month of October that the engine and machinery were completed, and placed in the pleasure-boat on Dalswinton lake. Nothing could be more gratifying or more complete than the success of this first trial; and while, for several weeks, it continued to delight my father and his numerous visitors, it afforded him the fullest assurance of the justness of his own anticipation of the possibility of applying to the propulsion of his vessels the unlimitable power of steam. On the approach of winter, the apparatus was removed from the boat, and placed as a sort of trophy in his library at Dalswinton; and, after his death in 1815, it came into my possession, and has been fortunately preserved as a monument of the earliest instance of *actual navigation by steam* of which any evidence or record has been produced *.

Of this experiment, an account, drawn up by Mr Taylor, was published in the Dumfries newspaper of the day. The experiment was also noticed in the Scots Magazine for November 1788, in the following words: " On October 14, a boat was put in motion by a steam-engine, upon Mr Miller of Dalswinton's piece of water at that place. That gentleman's improvements in naval affairs are well known to the public. For some time past his attention has been turned to the application of the steam-engine to the purposes of navigation. He has

* This little engine (4 inches diameter cylinders) was constructed by George Watt, brass-founder, Low Calton, Edinburgh. The cylinders are of brass, and the workmanship does great credit to the artificer.

now accomplished, and evidently shewn to the world, the practicability of this, by executing it upon a small scale. A vessel, 25 feet long and 7 broad, was, on the above date, driven with two wheels by a small engine. It answered Mr Miller's expectations fully, and afforded great pleasure to the spectators. The success of this experiment is no small accession to the public. Its utility in canals, and all inland navigation, points it out to be of the greatest advantage, not only to this island, but to many other nations in the world. The engine used is Mr Symington's new patent-engine." The ~~effect of these public notices~~ was such as might have been expected, in stimulating my father's ardour for further trial, on a larger and still more satisfactory scale.

Accordingly, in the summer of 1789, he directed one of his double vessels, of about 60 feet in length, to be carried to Carron, in order to be fitted up as a steam-boat, by furnishing her with revolving paddles, and a steam-engine suited to the supposed exigencies of the case. In this second experiment, he again availed himself of the zealous assistance of Mr Taylor, and again employed Mr Symington as the operative engineer. For this purpose, they were dispatched to Carron in the month of June 1789, and I have now in my possession the original letter sent by my father to the Carron Company, as introductory to Mr Symington's employment. It is as follows:

" GENTLEMEN, *Dunfermline, 6th June* 1789.

" The bearer Mr William Symington is employed by me to erect a steam-engine for a double vessel, which he proposes to have made at Carron. I have therefore to beg, that you will order the engine to be made according to his directions. As it is of importance that the experiment should be made soon, I beg also that you will assist him, by your orders to the proper workmen, in having it done expeditiously. I am ever, with great regard, Gentlemen, your most obedient humble servant, PATRICK MILLER.

" *Carron Company, at Carron.*"

In spite of the anxious ~~importance~~ thus expressed by my father for the rapid prosecution of the work, it was not till after

a lapse of six months that his vessel was ready to be put in motion. In the course of the first week of December he directed the vessel to be taken into the Forth and Clyde Canal; and having gone ~~abroad~~ with a committee of the Carron Company, and a party of his friends, and in presence of a vast multitude of curious spectators, the machinery was put in motion, and this second trial promised to be every way as prosperous as that on the lake of Dalswinton. It happened, however, unluckily, that the revolving paddles had not been made of sufficient strength; and when the engine was brought into full action, several of the float-boards were carried away, and a very vexatious stop was, for that day, put to the voyage. No time, however, was lost in repairing this damage, and, on the 25th December, the steam-boat was again put in motion, and carried along the canal at the rate of nearly seven miles an hour, without any untoward accident, although it appeared evident that the weight of the engine was an overburthen for the vessel, and that, under such a strain, it would have been imprudent to venture to sea *.

The experiment, however, was again repeated on the two following days; and having thus satisfied himself of the practicability of his scheme, he gave orders for unshipping the apparatus, and laying it up in the storehouses of the Carron Company, and directed Mr Taylor to call in the various accounts, and discharge the expences which the experiment had occasioned.

It was, I believe, my father's intention to have announced the result of the experiment in a regular publication, similar to that already noticed on the subject of double and triple vessels. In the mean time, the following brief notice made its appearance in the Edinburgh newspapers of February 1790.

" *Extract of a Letter from Falkirk.*

" *February* 12. 1790.

" It is with great pleasure I inform you, that the experiment which some time ago was made upon the Great Canal here,

* Her planking being only three quarters of an inch thick, although her length was sixty feet.

by Mr Miller of Dalswinton, for ascertaining the powers of the steam-engine when applied to sailing, has lately been repeated with very great success. Although these experiments have been conducted under a variety of disadvantages, as having been made with a vessel built formerly for a different purpose, yet the velocity acquired was no less than from six and a half to seven miles an hour.

"This sufficiently shews, that, with vessels properly constructed, a velocity of eight or nine, or even ten, miles an hour, may be easily accomplished; and the advantages of so great a velocity in rivers, straits, &c., and in cases of emergency, will be sufficiently evident, as there can be few winds, tides, or currents, which can easily impede or resist it; and it will be evident, that, even with slower motion, the utmost advantage must result to inland navigation.

"It is with great satisfaction that we have received this intelligence from our obliging correspondent. Every well-wisher to the extension of arts and commerce must be highly gratified with the signal success of this important experiment, which bids fair to introduce an improvement which, by greatly facilitating, and rendering more easy and speedy, the intercourse by means of navigation, must not only be highly advantageous to our own country in particular, but to the commerce of the world at large, and to mankind in general."

It may naturally occasion surprise and disappointment, that here I should have to terminate this account of my Father's experiments on Steam-navigation. That he did not follow up these prosperous and decisive trials of its efficacy, with the same spirit and perseverance which had been so conspicuous in many other instances, must for ever be matter of regret to his family, as it was to himself in the latter years of his life.

The fact, however, was, that, in the prosecution of this last undertaking, he had experienced a very violent disgust, *from the misconduct of one of those whom he had intrusted with its execution*, and had to complain not only of tardiness and negligence, but of the ill-regulated and enormous expence in which he had been unnecessarily involved. On these subjects I am unwilling to enter into farther details; but I may be permitted

to add, that, by this time, my father, in the prosecution of his various schemes of a purely public nature, and without the slightest chance or expectation of reimbursement, had expended towards £30,000; and being by this time ardently engaged in agricultural pursuits, his attention was more easily turned from the objects of his former speculation~~s~~, than those acquainted with his character would have been prepared to anticipate.

Be that as it may, it cannot be disputed, in point of fact, that he had fully established the practicability of propelling vessels, of any size, by means of wheels or revolving paddles, and of adapting to these the almost boundless powers of the steam-engine. In the way of pure invention nothing farther remained to be achieved, although, in the subordinate details of execution, great room remained for minor improvements.

Of my father's peculiar and undoubted merits as an inventor, I have endeavoured to give a fair and unvarnished account; and of the *reality* of that invention, as carried into actual practice in the years 1788 and 1789, no demonstration more unequivocal can be desired than that, with ~~his~~ few, but most satisfactory, experiments, the prosecution of this most momentous discovery remained suspended, for many years, in a state of inactivity and neglect, till, at a period comparatively recent, it was revived in America and in this country, by persons who can be proved to have derived their first lights from the experiments at Dalswinton and at Carron. On that subject I am in possession of ample evidence; but, at present, I have felt no other desire than to record the facts immediately connected with my father's operations, and to establish the priority of his claims to the credit of having originated, and carried into practical execution, an improvement in the nautical art, by far the most important of which the present age has to boast, and the ultimate effects of which, on the future intercourse of mankind, the most sanguine imagination would attempt in vain to predict.

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